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THE DORSAL PORES OF EARTHWORMS.

BY THE REV. HILDERIC FRIEND,

Author of 'Flowers and Flower-Lore.'

IF a specimen of the Common Earthworm is examined, especially after having been preserved for a time in spirits, it will be found that a number of pores exist on the back. They are most readily seen on the girdle as a rule, and look exactly like the holes which result from the puncture of a pin or needle. These openings have been known for a considerable time as the dorsal pores, a name which serves not only to define their position, but also to differentiate them from the other openings which exist on various portions of the worm's body, such as the male or spermiducal pores, the nephridiopores, and the puberty pores (*tubercula pubertatis*).

It is now many years since these apertures were originally detected. Who first observed them it is impossible to say. Equally difficult would it be to decide who was the first to notice their presence in describing the animals. In 1727 Dr. Derham, Canon of Windsor, wrote a very interesting work entitled 'Physico-Theology,' in which he endeavours to demonstrate "the being and attributes of God from his works of Creation." He says that under the skin of worms "there lies a slimy juice, that they emit, as occasion is, at certain perforations between the annuli, to lubricate the body, and facilitate their passage into the earth." A little later, however, he shows that a certain Dr.

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Willis had previously written an account of these "foramina on the top of the back, adjoining to each ring, supplying the place of lungs." Now Willis published his work, 'De Anima Brutorum,' in 1672, so that for upwards of two hundred years the pores have been known to science, to go no further back. It is only in recent years, however, that they have been carefully noted, and the position of the first pore recorded for the different species of worm. It has been thought by some that the first dorsal pore was so uniformly placed in the various species of Earthworms that a specific character might be based thereon. This I am disposed to think is not borne out by facts.

Dr. Benham, one of our few English authorities on the subject, says: "In many Earthworms the cœlom is put into communication with the exterior by means of a series of dorsal pores, placed on the intersegmental grooves. In *Lumbricus* these pores occur in every somite after about segment eight; in *Digaster* and *Perionyx* they commence just behind somite four; in *Plutellus* behind somite six; in *Pleurochæta* and *Typhæus* the pores are present only behind the clitellum. They are present in *Acanthodrilus*, and in many *Perichæta*.* In *Allurus* they begin behind segment three or four.

As will be inferred from the foregoing, a variety of ideas have prevailed respecting the use to which these apertures were devoted in worm economy. Willis says they supply the place of lungs, and if Derham's remarks apply to the dorsal pores, he regards them simply as the openings through which lubricants were poured. Lloyd Morgan is as cautious on the subject as he is inaccurate. He says: "Every segment of the body *except the first* has a dorsal pore opening into the anterior part of the ring in the mid-dorsal line, and two very minute pores, one on each side of the ventral line, which are the external orifices of the nephridia or segmental organs, whose function is excretory." The dorsal pores are not found in the typical Earthworm on every segment save the first, and if they were, we are not favoured by the Professor with a vestige of an idea as to their use. He says: "There are no specially differentiated respiratory organs, respiration being apparently effected by the surface of the body," so that he does not regard the dorsal pores as lungs.

* Q. J. Mic. Sc. 1886, p. 247.



The most important contribution to the subject is undoubtedly that which was made a few years ago by Hermann Ude, in a paper which deals chiefly with the structure of the body-wall in Earthworms.* He points out that "the dorsal pore lies on the anterior edge of the somites in which it occurs, and appears on the intersegmental groove. It is absent in the most anterior somites, but the position of the first pore is constant for a given species." In the Common Earthworm it occurs between eight and nine, and in the Turgid Worm between ten and eleven. We should say between eight and nine and nine and ten respectively. Claparède formerly described the epidermis as being folded inwards at the dorsal pore, just as it is where the setæ are situated, but Ude shows that such is not the case. By stripping off the epidermis I have been able to detect the infolding of the cuticle around the setæ, but not around the dorsal pore, which, as Ude affirms, is a perforation through the epidermis and the muscular layers. The pore is wanting in most Freshwater Worms or *Limicolæ*. Beddard has dealt with the exceptions. In some worms, when the girdle is fully developed, the pores become closed through the growing up of the cuticle around the edge. This is not always the case, however, for the Mucous Worm has been noted by some to be an exception, while I have found that the dorsal pore on the clitellum or girdle of some species is quite as discernible after the organ has attained full development as before.

If a worm is opened laterally, and the internal organs removed so as to leave only the body-wall, it will be possible so to display this portion of the animal as to see the whole series of pores in regular succession. It will be easy then to observe that they are connected with each other by a kind of tube which runs right along the back of the worm. I am a little doubtful whether or not this is what Ude refers to when he says that the epithelium of the body cavity passes across the muscular layers, and meets the cuticle around the edge of the pore. The pore has a special set of muscle-bundles which form its sphincter muscle.

Ude does not think there is the slightest connection between the pores and the nephridia, which are excretory in their function.

* Zeit. f. Wiss. Zool. xlv. pp. 85-142. Benham, Q. J. Mic. Sc. Aug. 1886, No. cv. pp. 102-4.

Yet in a sense the dorsal pores play their part in the excretory process, since the fluid contained in the cœlom or body-cavity, as well as certain other substances which in some species of Earthworm are coloured, can be caused to exude through them. Sometimes the exudation is in drops, but some foreign species are able to squirt it to a distance of a foot, much as *Peripatus* does. In these cases the process is perhaps protective.

In a memorable article on the Earthworm, published some years ago, Prof. Ray Lankester * says: "In the cuticle of the Earthworm a system of very minute canals exists, . . . which might either be described in connection with the respiratory mechanism, or here, if we regard these ducts as excretory pores . . . It is undoubtedly through these minute canals, which exist throughout the integument of the Earthworm, that water passes to the perivisceral cavity, and a dense fluid passes out." Ude tried a series of experiments to ascertain whether or not water was admitted through these pores, but he failed to satisfy himself that such was the case, though I have many times observed the denser fluid of which Prof. Lankester speaks issuing from them.

It is to Prof. Busk that we are indebted, through Prof. Lankester, for one of the best accounts of these apertures in English. In a remarkable paper on the Earthworm, published by the latter in 1865, we have an illustration of the integument of a Worm with all the various pores found on the dorsal surface carefully represented. "One of these orifices, situated in the median dorsal line of the segment, appears always to be larger than the others, and penetrates directly to the perivisceral cavity. That these openings form a very ready and frequent means of escape to the colourless fluid may be ascertained by handling a large Earthworm, when some considerable quantity is nearly invariably found to escape from its dorsal surface."† Nor is this all. Prof. Busk says that the fluid expressed from these pores was of a dirty greyish colour, thin and opaque. Examined under the microscope, it contained numerous spherical particles and pyriform granular bodies, besides irregular organic particles. This coloured fluid differs with the species of Worm examined. In some, as the Brandling and Turgid Worm, it is

* Q. J. Micro. Sc. 1865, pp. 9 and 10, "The Anatomy of the Earthworm."

† Ibid. p. 102.

yellow; in others, as the Mucous Worm, it is white; while the Red Worm yields two-thirds of colouring matter.

Mr. Beddard, in his invaluable 'Monograph of Oligochæta,' unfortunately leaves the subject almost untouched. He says (p. 13): "The cuticle seems undoubtedly to be a formation of the packing cells of the epidermis; the pores upon its surface are the outlets of the gland-cells, and their existence appears to be simply due to the fact that the gland-cells do not secrete a cuticle like the other cells, their secretory activity being taken up in the formation of the granules with which they are laden; hence at the points where they abut upon the cuticle there are gaps—the pores in question." In discussing the question of the coelom—a subject which has been somewhat fully treated by Mr. Lim Boon Keng, Straits Settlements Scholar, since the 'Monograph' was published—Mr. Beddard again (p. 30) introduces the dorsal pores, and as the paragraph represents the latest results, it will be well to give it almost *in extenso*. "The coelom," we are told, "is placed in communication with the external medium in a large number of the Oligochæta by a series of pores, one to each segment; in addition to these structures, which are called the dorsal pores, there is, in a certain number—most of the aquatic Oligochæta—a single pore on the prostomium, which is generally spoken of as the head pore" (and is found in the embryo *Lumbricus* (p. 32), though not in the adult). The dorsal pores are never developed upon the first one or two segments of the body, and the point where they commence is characteristic for the species. The dorsal pores were considered at one time to lead into sacs, the function of which was believed to be respiratory; it is now known that the pores are simply perforations of the integumental layers just at the anterior boundary of the segment to which they belong; there is no lining of epithelium, as has been erroneously stated to be the case; there is simply a discontinuity of the muscular and epidermic layers where the pores exist. The structure of these pores has been more particularly studied by Ude. Their structure in *Fridericia* has been studied by Vejdovsky and Michaelsen: "in these Worms the pore is bordered by large round glandular cells on each side; no such cells are visible in the case of the dorsal pores of Earthworms. We are at present completely in

the dark as to the morphological meaning of these pores." No relations are apparent between the dorsal pores and the nephridia. Michaelsen thinks the dorsal pores "have the function of nourishing the body and prevent its becoming unduly dry; it is certain that the coelomic fluid is pressed out through the pores, and their occlusion is regulated by longitudinal muscles. . . . Perhaps in the Oligochaeta the dorsal pores pass out the waste fluids, while the remaining excretory products are elaborated and passed out by the nephridia."

Thus we see that even now, notwithstanding the large amount of attention which has been paid to Earthworms during the past decade, we are very badly informed on many points connected with their economy; and there is great need that some one, with the necessary leisure, means, and scientific training, should investigate some of the details more fully. I have been able to make great progress with my work on the distribution and revision of the British Lumbricidæ, till recently almost totally neglected; and hope by the due publication of the new and interesting results to stimulate further research on the part of others.

Meanwhile, so far as the dorsal pores are concerned, they appear to be for the emission rather than the introduction of fluids; and are apparently lubricative, excretory, and protective. Their homology with certain organs found in other annelids does not seem to have been carefully ascertained; at any rate I know of nothing on the subject in English.

NOTES ON THE CHACMA BABOON, AND THE MAANHAAR JACKAL, &c.

BY DR. S. SCHONLAND.

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SUPPLEMENTING the editor's article on the Chacma Baboon (*ante*, p. 29), I may state that this animal has now become a regular scourge in some parts of Cape Colony, for a quite unexpected reason. It is perfectly notorious that it has largely taken to killing lambs, for the purpose chiefly of sucking the milk with which they have filled their stomachs. The reason that it has, if anything, increased in the colony during recent years is twofold. Firstly, the alarming spread of the prickly pear (*Opuntia* sp.) in some districts has provided it with almost impenetrable shelter and abundant food, as it is very fond of the fruit and also eats the leaves. Secondly, it has become so cunning that only by means of artful manœuvres can one get a shot at it. A friend of mine, whose wife could approach a troop of Baboons without disturbing them, borrowed one day her cloak and hat and then went out. They let him approach to within very close quarters, and two of them were shot before the remainder got into shelter. Sometimes the farmers of a district combine and during the night surround their sleeping-place. As soon as the day breaks and the Baboons try to escape they are shot down in large numbers; but this method of reducing their ranks is not always practicable.

The Baboon is not the only South African animal which has during recent times changed its habits. Thus, the so-called "Wet-gat Spreouw," *Spreo bicolor*, was formerly never known to touch fruit, its food consisting entirely of insects, but during recent years it has, at all events on some farms with which I am acquainted, become very destructive to fruit. Another case, which possibly comes under the same category, is that of the Maanhaar Jackal, *Proteles cristatus*. The Cape Government was paying a high reward for the destruction of this animal, because it was supposed to be destructive to small stock. I protested

publicly against this, as I had never found anything but insects (especially Termites) in the stomachs of those which I had dissected; and the unanimous testimony of experienced and trustworthy farmers in our district was to the effect that although it does a little damage by breaking Ostrich eggs, it very rarely if ever touches live stock; in fact, only one certain case was cited to me in which the bones of a lamb were found in the hole inhabited by Maanhaar Jackals, who had to provide for a litter of young ones at the time. I need scarcely say that this case does not prove that the Maanhaar Jackal kills lambs, as he is known to devour carrion. To my astonishment I was met by a howl of indignation, proceeding from farmers living in other districts, who were positive that this animal was a dangerous enemy to their flocks; and if they are correct (and I must say that there were intelligent and observant men amongst them) the Maanhaar Jackal must have changed its habits during recent times and in certain districts only, when possibly with the advance of civilization its natural food is failing. However, I cannot admit that the question is definitely settled.

ZOOLOGICAL RAMBLES IN AND AROUND THE TRANSVAAL.

By W. L. DISTANT.

IN that very stirring Christmas week of 1895, and quite unconscious that we were projecting a journey that, a few days later, would have almost brought us in contact with Dr. Jameson and his merrie men, my son and self decided to spend the vacation at Rustenburg, there to collect, under the guidance of that good field naturalist, W. Ayres, who has made the sleepy spot his home for a number of years. We started on the afternoon of December 22nd, driving a light cart, attended by our Zulu "boy" John, and armed with necessary apparatus for a successful ornithological and entomological raid. Guns, nets, a taxidermal box of sundries, stifling-bottles, boxes, &c., helped to crowd the already well-filled vehicle, and incited a wish that the "roads" might not prove too heavy.

After leaving Pretoria and passing through Daas Poort—a spot ten days later to mark the nightly vigil of armed Boers—the road crosses a level veld between two ranges of hills. Here one may generally see an occasional Secretary Vulture, *Serpentarius secretarius*, and as there is now not only a heavy penalty for killing one of these birds, but also an inducement offered to the "common informer" by giving him a share of the legal plunder, the "Secretary" is seldom molested. It is, however, an over-rated bird, so far as its snake-destroying propensities are concerned; its usual food—and I have conducted more than one *post-mortem*—consists of small lizards, especially *Agama hispida*, and, in the season, orthopterous insects. To approach one of these birds on the open veld with only a shot-gun is frequently a vain quest. As you walk towards it, so does it walk away; as you quicken your pace the bird does the same. Still there are times and seasons when a casual and nearer acquaintance is made, though a rifle is the best weapon with which to supply a museum.

The Secretary-bird has a peculiar and stately demeanour which any one acquainted with the bird in a state of nature does not easily forget, and nothing seems more inexact than the description given by Brehm, when he writes, it "runs about among the tall grass-stems, or hovers above them."* An excellent figure of the bird in a state of nature is given by Mr. J. G. Millais, in his 'A Breath from the Veldt.' The weight of a very large specimen, whose skin I possess, was in the flesh only 10 lbs. My son once came across one roosting in a tree, or "thorn-bush," at sundown.

Driving along this road, and when one passes a swampy space, or crosses a sluit, it is not unusual to disturb a Hammerkop, *Scopus umbretta*, when it takes to its slow and heavy flight. A writer in the excellent 'Royal Natural History,' recently completed, states:—"Everywhere these birds are mainly crepuscular, and are but seldom seen in full daylight." This is certainly not my own experience, for, especially in the winter season, these birds are in evidence all day long to one who goes far afield and in their haunts. The Hammerkop is plentiful around Pretoria, wherever sluits, water-holes or marshes are found. It is an unsuspecting bird and easily approached. I once marked one down that had settled in a water-hole not more than six feet broad though moderately deep, and I actually reached its edge before the bird took flight. It is much scarcer near the town in the summer, when it has probably retired to breed.

Along the road, and especially on telegraph-poles, one usually sees Buzzards, especially *Buteo desertorum*. This was the prevalent species near Pretoria when I visited the country before, but seems now—or was during my second sojourn—much scarcer; while, *per contra*, the Black-shouldered Kite, *Elanus caeruleus*, which I formerly described as scarce, hovering high in the air, and generally out of reach of the gun, was now plentiful close to the town, and to be seen in trees near dwellings. The real habits of birds are not to be discovered except under prolonged observation.

After crossing the Crocodile river, over which there is now a good bridge, we outspanned at a roadside canteen, kept by the

* 'From North Pole to Equator,' p. 187

inevitable "Peruvian"* or Russian Jew, whose *inferior* liquors, with the illustration of drunken Kafirs around the establishment, proved once more that, with few exceptions, these people should never be entrusted with a licence. The best law passed by the Transvaal Government of recent years, and, to their credit be it said, in the face of great opposition by some of their interested and selfish supporters, is one which now prohibits the sale of intoxicants to natives, entirely necessitated by the vile compounds supplied to the Kafirs at the mines. However, by pushing on we reached another roadside house kept by an English Colonial and a Dane, and there we passed the night.

This thickly wooded spot, in the vicinity of a well-known Nek, is an excellent halt for the ornithologist. It was here I first met with the African Grey Hornbill, *Tockus nasutus*, a bird, strange to say, which became rather common in the gardens of Pretoria during the winter months of 1896. Hornbills are not averse to human habitations, and I had brought to me the yellow- and red-billed species, *Lophoceros leucomelas* and *L. erythrorhynchus*, both killed in town gardens.

Although the season had been abnormally dry, we now found many boggy and loose sandy tracks, to avoid which loop ways had been made through the trees, though these were often little better than the discarded road. In these sandy tracks I found the Cicindelid beetle, *Manticora tuberculata*, and later on I was able to add to the list of its victims a small member of the Cicadidæ, *Callipsaltria longula*, which I extracted from its closed mandibles. It is often thought and frequently stated that the Cicadas are a highly protected group, owing to their generally assimilative hue, when at rest, to the twigs or boughs which they frequent, and certainly some species are difficult to detect. But any concealment thus acquired is more than negated by the stridulation of the males, and protective resemblance can scarcely be a factor in the insect's existence when by its piercing notes it proclaims the place of its concealment. In collecting I was usually apprised of their whereabouts by their stridulating music, and the difficulty I experienced in finding them among the bush would improbably be felt by birds. As if aware of the danger they incur by

* S. African corruption of a local European name for these people.

their noise, they become absolutely silent when one approaches the tree lately resonant with the efforts of the cicadan orchestra; but that is too late for protection. They have many enemies in all parts of the world in which they are found, being not only eaten by birds but attacked by such varied insects as Mantidæ, dragonflies and hornets, whilst, as remarked above, the beetle (*Manticora*) can now be added to the recorded list. They also fall a prey to spiders, are attacked in the egg condition by larvæ of ichneumons, and are also sometimes afflicted by a fungoid growth.

Further along the road our way lay across what to S. African travellers is so well known as turf, and after prolonged wet this remains in a terrible condition for vehicular traffic, though in other parts the country may be baked and burnt up, as it was at this time. Our faithful Zulu had to lead our horse, and did so cheerfully and uncomplaining for ten hours at a stretch. I provided him with a bottle of "Cape smoke" as some sort of stimulant under the strain, which he consumed and seemed none the worse for. But when we reached the Hex River, and John led our horse—an animal with a strong dislike for fords—across it, he entered the river on one side sober, and, dreadful and strange to relate, came out the other side in a state of intoxication, the effects probably of the lukewarm and swiftly-flowing water. With a demoralized Zulu fastened to the back of our trap, we made an inglorious entry into Rustenburg about 9 p.m. However, once at the 'Masonic Hotel,' a good supper soon put us to rights, while our faithful servitor speedily became again clothed and in his right mind.

The next morning we were joined by our good friend Ayres, who acted as our guide during the stay, and whose acquaintance with the lives and habits of the living creatures that frequented the country around was equal to the combined knowledge of a field-naturalist and a sportsman.

We had arrived at a bad time. No rain had fallen for some weeks, and the country was parched up. Birds were practically absent, and so we decided to try and find the good things of the place.

Rustenburg is famous for some fine beetles, and we made long excursions in search of a few rare species. In the Cetoniidæ the pride of place centres in *Goliathus albosignatus*. This beetle is

to be netted as it flies among its favourite trees, a species of *Zizyphus*,* but it is very rare, and only a few are annually secured. The beautiful *Ceratorrhina burkei* and the resplendent *C. derbyana* are found on the twigs or silky leaves of a species of *Combretum*, probably *C. holosericum*; but though the second species can usually at the right time be found, the first is a beetle to be "hoped for." We walked many miles to a nook found by Ayres to be a peculiarly favoured spot in the restricted area of this species. A fine large Prionid *Tithoes confinis* is found under the bark of dead trees, and we procured an example of the large Cicindelid *Ophrydera rufomarginata*; so it will be seen that Rustenburg has some attractions for the coleopterist, but it should be visited early in the summer, and shortly after the rains have commenced.

In the search for these insects we reached the hills and the narrow perpendicular waterfall, which can be often seen a long distance away. Here, enclosed by trees and rising ground, we experienced that peculiar charm of South African scenery that is gradually acquired, never forgotten, and yet is so difficult to analyse or describe. But, as is so frequently the case among these surroundings, animal life was abnormally absent and there were no flowers; it seems a country—to the naturalist—of the past. The water after its long perpendicular drop flows through some rocky pools beneath, and I never drank any that possessed such a tonic and highly stimulating effect. After drinking it we seemed to have left all fatigue behind, and to be invigorated for a fresh march. This was once a fern paradise; a few tree ferns are still left, but unfortunately a market has been found for them, and civilisation has once more ransacked nature.

Among birds the South African Paradise Flycatcher, *Terpsiphone cristata*, is not uncommon at Rustenburg, and I found the nest during my stay. It is well described in Layard's 'Birds of South Africa,' as "composed of fibres and dead leaves, stuck over with bits of bark, cobwebs, and lichens to resemble a knot in the tree." The last sentence, however, is not to be taken as denoting concealment, for the nest is thoroughly exposed. I found this one on a projecting branch on which were very

* For the botanical determinations I am indebted to my friend Dr. S. Schonland, of the Albany Museum, Grahamstown, to whom I submitted specimens.

few leaves. In the work referred to it is stated to be found "generally in the neighbourhood of water," but this is not invariable, for the nest I found was on a rocky mound in a most arid spot. It contained two eggs, so I presume December is the time of nidification. The internal cavity of my nest is 60 by 50 millim. expanse, and 25 millim. deep. The rarest bird I procured was the Red-headed Weaver Bird, *Malimbus rubriceps*, but this I obtained from W. Ayres, and but one other specimen had ever passed through his hands during a life-time's collecting in the South African bush. I also brought away with me the skin of *Scops capensis*, the Cape Scops Owl, and *Centropus senegalensis*, the Lark-heeled Cuckoo. A flying visit of a few days, after all, gives little opportunity of grasping the real peculiarities of a local fauna, and the short time spent at Rustenburg would have been almost barren in result but for the guidance of the local naturalist. We worked hard during our stay, finishing real work on Christmas Eve, when I smoked the evening pipe with the well-known Anglican Prebendary who has settled in the home of the Dopper Boers, with a small church, a small flock, and no intention of leaving. We had our last insect hunt on Christmas morning, and then after a mid-day banquet—of Rustenburg limitations—shook the hand of our genial guide and companion, and started on the homeward track. We had some good shooting in the afternoon among Crowned Lapwings, *Chettusia coronata*, and Yellow-throated Sand-grouse, *Pterocles guttularis*, as we drove along, but the drought dominated, and little animal life was to be seen. On the banks of a sluit we disturbed a Monitor, *Varanus niloticus*, but this is neither worth shooting nor keeping alive, or rather endeavouring to do so. I once had one in my possession for three months, and during the whole of that time it abstained from food, though I supplied it liberally with small lizards, frogs, eggs, meat, orthoptera, and on one occasion tried to tempt its appetite by the offer of a small harmless water-snake. I kept it in a large tank of water with an artificial rockery in the centre, on which it could rest above the surface, which it usually did; but it refused all food and ultimately died of exhaustion, when, by request, I packed its body off to the Grahamstown Museum.

It was interesting to watch the behaviour of the frogs, most

of which spent the whole time with this *Varanus*. They were at first evidently imbued with the most abject terror when the Monitor approached them, and would huddle together immovable, and with their eyes fixed on their enemy; but in the course of a few weeks, when they found they were not attacked, and familiarity breeding either contempt or friendship, they frequently rested on the reptile's back. The frogs were varied, belonging at least to several genera, so that they could not have been all "distasteful." The frogs rapidly acquired experience, and overcame what may loosely be called an "instinctive" fear.

NOTES AND QUERIES.

MAMMALIA.

HOMINIDÆ.

Human Bones at Brome hill.—On both sides of the Little Ouse River, for several miles between Brandon and Thetford, human bones have been at various times found on the surface or unearthed in considerable numbers. I myself have found them exposed on the ground on several spots on the north bank, chiefly near Brome hill Mere, in the parish of Weeting, and at St. Helen's Well (or "Tanner's Pit"), the site of St. Helen's Church, Thetford. The bones at the latter place were doubtless buried there at various dates. In February, 1885, in the meadow a few yards west of Brome hill Mere, I saw, by the mouth of a rabbit-hole, part of a human skull, many human bones, bones of cat, horse, sheep, and rabbit, two flint "scrapers" of neolithic work, three "plague-pipes" (tobacco-pipes of the date of Charles II.), and fragments of pottery ancient and modern, glazed and not glazed. Some of the ancient bits were of a greyish brown (as if they had only been dried, but not burned or baked), and contained in the substance of the clay many small white stones. One small bit of this grey-brown or unburnt ware has the imprint as of wicker-work on its convex side, as if it had once formed a clay lining to a basket, possibly to make the basket water-tight before folk knew how to make pots to stand alone without a basket to hold them together. On enlarging one of the numerous rabbit holes (nearest to the human bones) with my hands and feet and sheath-knife, I grubbed out three more human skeletons, apparently perfect. Whilst taking them out the Weeting gamekeeper came and watched me, and told me of an old man who once ploughed this meadow, and who declared that he turned out men's heads all over the place. I was benighted by the time I had secured three skeletons, but from what I have seen and heard there must be many thousands only just covered, or partly covered. These three skeletons seemed to have been hastily "crowded" in, so that they were somewhat mixed and in different postures. I could not find any sign of east-and-west posture, or any specially recognised posture, nor any trace of violent death, nor of any metal, pottery, ornament, stone implement, or clothing with them. This particular spot is marked on the Ordnance map as the site of Brome hill Priory. The various articles I saw on the

surface are no evidence of date for bones just *beneath* the surface. I fancy these three skeletons, and most of the others ploughed up formerly, and found at intervals between Brandon and Thetford, belong to victims of the Black Death in 1349. The severity of that plague in the eastern counties, and especially in the Thetford neighbourhood, seems to account for the crowded condition, various postures, and absence of ornament, metal, or other possessions.—FRANK NORGATE (Bury St. Edmunds).

AVES.

Breeding of the Roseate Tern in Britain.—I have pleasure in reporting the fact that this elegant and most beautiful of our Sea-swallows, *Sterna dougalli*, is not yet extinct as a British breeding species, and that it still has a regular nesting haunt in the British Isles. Your readers will be aware that eminent and leading ornithologists have for some years been of opinion that the Roseate Tern only visited our coasts as a casual summer migrant, and this has been so stated in all recent works on British birds. Indeed, the late Mr. Henry Seebohm writes, "It is doubtful whether the Roseate Tern nests in any part of the British Islands at the present time." However, for the past few years I have known of a colony of these birds nesting annually in Britain; but of course, for obvious reasons, I must refrain from naming the precise locality. In 1895, I sent Mr. J. T. Proud, of Bishop Auckland, specimens of their eggs, and informed that gentleman of the whereabouts of the locality, and last year he visited the place, saw the birds, and obtained their eggs himself; and I understand he has had the pleasure of supplying the British Museum with such specimens, and has satisfied the British Museum authorities that this Tern is still a British-breeding species.

It is satisfactory to know that these rare birds have selected a portion of our islands for rearing their young where they are not likely to be much molested by man; in fact, as can be supposed, it is far from the path of the ordinary tourist or collector, and it is to be hoped that those gentlemen who are already aware of the habitat in question will keep it secret for the sake of the birds and British ornithology. I may also point out that their eggs are readily distinguishable from those of other and closely allied species.—E. G. POTTER (14, Bootham Crescent, York).

[In our last issue (*ante*, p. 130) Mr. Gurney does not seem to think it improbable that these birds may nest again in Norfolk, as they once were known to do not many years ago. Mr. Ussher, in the March number of the 'Irish Naturalist,' writes:—"The Roseate Tern is recorded by Thompson to have bred in Down, Dublin, and Wexford; but at the present day no breeding place of this species in Ireland is known."—ED.]

Little Auks and Little Gulls at Scarborough.—I notice that in Mr. Gurney's interesting notes from Norfolk, he remarks that the last two winters have produced scarcely any Little Auks in his district. My experience during the winter of 1895-6 was similar, as I noted only two occurrences of single birds in each case; but it may be interesting to record that during the past winter this bird has occurred in greater numbers than usual, although the migration has not nearly equalled that of the winter of 1894-5. The following extracts from my note-book will give an idea of the comparative abundance in which they have occurred:—1896, Oct. 29th, two seen in North Bay; 31st, one shot in North Bay; Nov. 1st, one caught alive in South Bay; 5th, ditto; 6th, two washed ashore. After the early part of November they did not occur in numbers regularly, although a few stragglers were noticed; but in January and February of the present year considerable numbers were seen, in small flocks of from three or four, up to a dozen together. On Sunday, Feb. 7th, I picked up five which were washed ashore dead, but all quite fresh, on the beach between Scarborough and Gristhorpe.

I notice also Mr. Gurney mentions that more Little Gulls than usual have occurred. Four were noticed here during January, which is in excess of the usual occurrence of the species in this district. They were all immature birds. The Sclavonian Grebe has also been more abundant this winter; I have had four examples brought to me, and have seen several others.—W. J. CLARKE (44, Huntriss Row, Scarborough).

Red-legged Partridge Migrating.—As the Red-legged Partridge is not usually considered a migratory species, the following notes may prove of interest to readers of 'The Zoologist.' I must first remark that this bird has not extended its range, as a resident, into the Scarborough district, and we have only three records of its occurrence during the last seven years, which took place under the following circumstances:—On April 4th, 1890, one was seen to come from the direction of the sea and fall exhausted on Filey Road (only a few hundred yards from the beach), when it ran into a doorway and suffered itself to be captured. On April 4th, 1896, another was seen coming over the water from the east; it alighted on the East Pier, where it was picked up, too weary to make any attempt at escape. The third example was seen coming over the sea from the east on March 22nd, 1897, and dropped exhausted in the water a short distance from land. It speedily drifted ashore, and was secured and brought to me. The fact of the only three examples of which I have records having all come in from the east, at the same period of the year, in a very weary and exhausted condition, seems to point to the conclusion that in isolated cases, at all events, this species may be classed amongst our migratory visitors.—W. J. CLARKE (44, Huntriss Row, Scarborough).

Strange Discovery of a Tit's Nest.—On Nov. 12th, 1896, the sawyers at the wood-yard of Messrs. S. Allsopp & Sons were engaged in cutting up into planks a very fine broad-leaved elm-tree, the trunk of which was five feet in diameter at the base. The tree had been felled in front of Kinlet Hall, near Highley, Shropshire. Judging from the size, the tree must have been from two to three centuries old. About seventeen feet from the base they found a small cavity containing three nails and also a perfectly-formed bird's nest; on this was a perfect egg, which was unfortunately broken during the manipulations. But on removal of the upper layers another nest was found, containing four eggs in a fair state of preservation. From their size they were probably laid by a Blue Tit, and the markings are quite plain, although somewhat faded. Judging from the disposition of the woody fibres, I think that the original aperture must have been closed by the growth of a large branch which finally coalesced with the main trunk, and so cut off all communication with the outside. I am indebted to the courtesy of Mr. Maxwell Tod, the secretary of the Company, for the opportunity of recording these facts.—PHILIP B. MASON (Burton-on-Trent).

Yellow Wagtail in Argyllshire.—I beg to record the occurrence last spring (March and April, 1896) of a solitary specimen of the Yellow Wagtail, *Motacilla raii*, about a mile from Oban, Argyllshire, N.B. It alighted on a stone bridge within a yard of where I was standing, enabling me to quietly and minutely examine and determine the species certainly to my satisfaction. I note Messrs. J. A. Harvie Brown and T. E. Buckley, in their 'Fauna of Argyllshire and the Inner Hebrides,' remark the scarcity of the bird thereabouts, so send you this account of my own personal observation.—ROBERT ROBINSON DAVISON (3, Waterloo Avenue, North Strand, Dublin).

The Ostrich.—In an important article of last month's 'Zoologist,' Mr. Schreiner calls attention to a great many fallacies which have hitherto been generally accepted as facts. The German naturalist Brehm, several years ago, in an essay entitled 'The Steppes of Inner Africa,' wrote a description of the habits of the Ostrich which agrees in several points with Mr. Schreiner's views, as, for instance, in the question of polygamy or monogamy; but in a quotation added by the editor to the English edition, which appeared last year, are the following remarks; and I think they are characteristic of the misconceptions existing in scientific circles as to the habits of this bird:—"Ostriches, though sometimes assembling in troops of thirty to fifty, commonly live in companies of four or five—one cock and the rest hens. This is especially true at the breeding season. All the hens lay together; the cock broods during the night; the hens take turns during the day, more it would seem to guard their common treasure from

jackals and small beasts of prey than directly to forward the process of hatching, for that is often left wholly to the sun. Some thirty eggs are laid in the nest, and round it are scattered perhaps as many more, which are said to be used as food for the newly-hatched chicks."

When the zoologist reads corrections of errors which have existed up to the present time with reference to a bird with which man has had direct acquaintance for nearly half a century, he may console himself with the thought that the zoological field has not been entirely explored, and that there is still room and time for fresh discoveries and observations.—G. W. SMITH (Winchester).

Ornithological Folk-Lore.—In reply to Mr. Bird's query (p. 144), Mr. Moore ('Folk-lore of the Isle of Man,' p. 151) states:—"Some of the names" (*i. e.* of the "seven sleepers") "vary. Craitnag (the Bat), Coog (the Cuckoo), Cloghan-ny-cleigh (the Stonechat), and Gollan-geayee (the Swallow), are found in all the lists; the others being Crammag (the Snail), Doallag (the Dormouse), Foillyean (the butterfly), Shellan (the Bee), Jialgheer (the Lizard), and Cadlag (the Sleeper), a mythical animal." Mr. Kermode ('Manx Note-book,' No. 4, p. 122), says:—"I have always heard that there were seven, though there seems a difference of opinion as to which were the seven. The following list I have received from a Manksman, now nearly ninety years of age, who knows every part of the island, and whose memory is good:—Foillyean (Butterfly), Shellan (Bee), Jialgheer (Lizard), Craitnag (Bat), Coog (Cuckoo), Clogh-ny-cleigh (Stonechat), Gollan-geayee (Swallow). The Hedgehog is not included, and I fancy has no more claim than the Dormouse, which has been included by some, but which, not being a native of the island, is unlikely to have a place in any Manx tradition." The Stonechat mentioned above is probably, as elsewhere pointed out by Mr. Kermode, the Wheatear (often so called in the island), as *Saxicola rubicola* does not disappear in winter. It will be observed that our "seven sleepers" are not, like those of Dorset, all birds.—P. RALFE (Laxey, Isle of Man).

Amongst the Birds in Norfolk.—Green Sandpipers.—A pair of these birds appeared on the Haddiscoe marshes on Jan. 11th, and allowed me to get within easy shooting distance before they took wing; another of the same species appeared on Feb. 22nd. These birds somewhat frequently appear, more especially during August and September.

Golden Plover.—A specimen of this bird attracted my attention on April 4th. During January large flocks of these birds were daily feeding on the marshes, the greatest quantity I have seen during the past ten years; one flock must have numbered about a thousand.

Redshanks.—On Feb. 15th I flushed five Redshanks on the verge of

the river Waveney, a rather early arrival. Some thirty couples of these birds annually breed on the ronds by the side of this river, and the adjacent rough marshes between St. Olave's Bridge and Burgh Castle.

Wagtails.—A specimen of the Yellow Wagtail appeared on the marsh on March 29th. A large number of Pied Wagtails are now scattered about the district. Yellow Wagtails breed in quantity on the marshes.

Grey Crow on Haddiscoe marshes, April 9th.

Wryneck.—I have only heard the Wryneck's note once during the past three years; the birds seem to have forsaken the district, though the reason why is not easily understood.—LAST. C. FARMAN (Haddiscoe, Norfolk).

AMPHIBIA.

Frog attacked by a Rat.—Is it not unusual for a Rat to attack a Frog? My gardener was walking beside a hedgerow the other day when he heard a commotion and squeaking in the ditch. On investigation he saw a large Rat with a fair-sized Frog in its mouth. He then threw something at the pair, and the Rat allowed the Frog to escape, which hopped quickly away into a place of safety.—T. A. GERALD STRICKLAND (Oakleigh, near Ascot, Berks).

[Frogs killed by Weasels are recorded in 'Zoologist' (1851), p. 3273, and ib. 3rd ser. vol. xii. p. 140. A more remarkable case of a Rat killed by a Frog is described in 'Zoologist,' 1849, p. 2471.—ED.]

INSECTA.

The Magpie-moth eaten by Birds.—Last spring my garden was visited with a regular plague of the gooseberry grub and moth; the leaves and fruit-buds were entirely eaten up, and the stems of the bushes were covered with the brightly-coloured grubs; while a little later the moths were all over the place. I caught them by dozens (both grubs and moths), and put them in my aviary, containing Greenfinches, Bramble-finches, Chaffinches, Yellowhammers, Redpolls, and Canaries, by whom they were greedily eaten; the moths were eagerly chased and caught, and so keen were the birds after them that I only remember seeing one escape out of the large numbers that were put in. I am told it is very unusual for birds to so readily devour this species. There is always plenty of food in the aviary, so it was not hunger, but simply choice.—W. T. PAGE (6, Rylett Crescent, Shepherd's Bush).

[This well-known moth, *Abraxas grossulariata*, generally known as the "Currant" or "Magpie" Moth, is usually reported as "protected" from the attacks of birds. Poulton, in his 'Colours of Animals,' speaks of the "slow-flying moth itself, with white wings rendered conspicuous by

yellow markings and black spots," as defended, like its larva and chrysalis, by nauseous qualities.—ED.]

ECHINODERMATA.

Asterias tessellata, or Scutellated Star-fish.—During the month of January last I received from the Rev. J. Rae, of Lindisfarne, owner and occupier of the property whereon St. Cuthbert lived so many years, a very fine living specimen of *Asterias tessellata*, a species that I have never found on the east or north-east coast. It is also the first that any of the fishermen of Holy Island can remember having seen.

The Brittle Star, *Ophiura granulata*, I have also never seen on this beach, but I have had the species brought from the Farn Islands, where, I am told, it is plentiful. The dimensions of the specimens of *O. granulata* sent me were in thickness 1 in., diameter $7\frac{1}{2}$ in., circumference 22 in.—JAMES SUTTON (33, Western Hill, Durham).

[*Asterias tessellata* is given by Prof. Jeffrey Bell, in his 'Catalogue of the British Echinoderms,' as a synonym of *Pentagonaster granularis*, Retzius. The same authority gives as its distribution "both sides of North Atlantic; to Arctic Ocean and White Sea on the east." Mr. Percy Sladen, under the synonym of *Pentagonaster balteatus*, has described the species from the south-west coast of Ireland (lat. $51^{\circ} 1' N.$, long. $11^{\circ} 50' W.$). Forbes, in his 'History of British Starfishes,' does not mention it.

Ophiura granulata is, according to Prof. Bell (*l. c.* p. 129), a synonym of *Ophiocoma nigra*, Abilg., with a distribution as "Scandinavian Seas; Barents Sea." Forbes (*l. c.*), under the name of *Ophiocoma granulata*, records it having been found at Cornwall, Berwick, Strangford Lough, open sea on coasts of Down, Dublin, and Kirkwall Bay, Orkney. Thompson ('Natural History of Ireland') states that it is common on the Dublin coast,—ED.]

NOTICES OF NEW BOOKS.

Ethnology. By A. H. KEANE, F.R.G.S., &c. Second Edition, Revised. Cambridge: University Press. 1896.

THIS is the second and revised edition of a valuable, widely noticed, and in some cases severely criticised book, of which the first edition appeared in 1895; and although the author, a man of the widest reading and acquaintance with his general subject, is not strictly a physical anthropologist, he has still supplied one of the best introductions to the study of Man that even modern zoologists can obtain. This revised edition is without those instances of *lapsus calami* which were pointed out when the work first appeared, references which the author doubtless welcomed, as he himself has written here and there in a freely controversial style.

Man's position in the animal kingdom is sought to be determined from the purely zoological standpoint. "That he is an animal, and as such must be related to other animals, is no discovery of modern science. Then the schoolmen defined him as *animal rationale*, a definition which the ethnologist may accept without hesitation as at least partly true. What modern science has done is to give precision and completeness to this definition, by fixing the place of Man as an animal in the class of mammals, and by separating him, mainly in virtue of his exclusive possession of articulate speech, from other animals to whom the reasoning faculty can scarcely be denied. Man will accordingly here be considered as a rational animal possessing the faculty of articulate speech." These sentences may be taken as Mr. Keane's prolegomena, and evolution is used as the argument throughout.

The book is divided into two Parts, "Fundamental Problems" and "The Primary Ethnical Groups." In the first the evidence for the antiquity of Man is very fully and ably treated, and a feature of great convenience to British zoologists is a descriptive list of the principal areas in Britain which palæolithic Man is

known to have inhabited, with a reference to the animals whose remains are associated with his rude flint implements. Full of suggestion also are the comparisons between the faunas of the periods of palæolithic and neolithic culture.

In the chapters devoted to the "Specific unity" and the "Varietal diversity" of Man, the arguments used on these points by anthropologists are well worthy of consideration by general zoologists; and when we remember the very elastic use of the terms species and variety necessarily made by monographists and descriptive naturalists, we may somewhat incline to the dictum of our author, who writes:—"It is not always easy to draw the line between species and mere variety, more especially as to neither of these terms is any longer attached the idea of finality."

In the second division of his work Mr. Keane discusses the "main divisions of the *Hominidæ*, and, adopting Linné's original fourfold division, divides his subject under the following classification:—"Homo *Æthiopicus*," "Homo *Mongolicus*," "Homo *Americanus*," and "Homo *Caucasius*."*

In conclusion, we will advise the reader to bear in mind an excellent remark in the author's preface: "In a work of this nature, dealing with a multiplicity of subjects on all of which nobody can be supposed to have personal knowledge, it is not to be expected that the views advocated, or even the mere statements of facts, will be always accepted on the *ipse dixit* of the writer. Hence the necessity of constant reference to received authorities." These are abundantly quoted throughout, so fully indeed that a student who would with an open mind refer to and fully read the references given by Mr. Keane—either with approval or disapproval—could not fail to obtain a somewhat complete grasp of anthropology. And this we consider is the province of a good hand-book, not to dogmatise or inculcate a canon of scientific faith, but to present the whole subject to the enquirer, and not only guide him to the good roads, but mention also the jungle-paths where investigation is not always barren.

* It is at least worthy of remark, that in two contemporaneous standard works, both bearing the imprimatur of Cambridge, and written by writers so diverse in thought as Mr. Keane and Dr. Sharp, and on animals so widely separated as Man and Insects, a reversion to the system of Linnæus should in each case have been more or less followed.

The Present Evolution of Man. By G. ARCHDALL REID.
Chapman & Hall Limited. 1896.

To adequately notice a book like this—a product of sustained thought and research—within the limits of our pages is impossible; to review such a work with critical examination is beyond the province of our Journal. We can only approach it here from the standpoint of zoology: a somewhat bare proceeding, perhaps as unsatisfactory to the author as irksome to the writer.

In the first section, "Organic Evolution," Dr. Reid clearly defines his standpoint, and enunciates his axioms so that we may readily understand the method of his argument. He adheres to the theory of spontaneous generation, which he remarks "is popularly supposed to be quite exploded. What is exploded is that such highly organized beings as the Infusorians arose spontaneously." And with respect to organic evolution it is stated that, though "many proofs will incidentally be afforded" of its actuality, "it will be assumed that the truth of it is admitted."

A postulate to which considerable importance is attached, and one which bears no little reference to the whole argument, is "that every species must necessarily undergo retrogression, unless that retrogression be checked by selection." On the other hand, "it is possible by means of selection to bring about rapid and extensive, indeed unlimited retrogression." Thus we read: "The domesticated Dog is presumably descended from one or more of the different wild varieties, or from their relatives the Wolves. Now, considering the length of time Dogs have been domesticated, and the severity of the selection to which they have been subjected, our largest Dogs, the St. Bernards, Newfoundlanders, Mastiffs, Boarhounds, do not very greatly exceed Wild Dogs or Wolves in size, nor do our most intelligent Dogs greatly surpass them in intelligence; but our smallest Dogs, some of them little bigger than Rats, are very much smaller, and some of our tame breeds are exceedingly stupid. Clearly, as regards Dogs, we have been able to produce little evolution, but great retrogression."

We still, however, require more experimental facts, repetitions of such experiments, and with different species, before we can

consider many of our conclusions absolutely unassailable. Thus Dr. Reid remarks:—"A young chick, for instance, emerges from the egg the possessor of a large amount of hereditary knowledge," and alludes to the brilliant researches on that matter by the late Douglas Spalding. With Dr. Reid we had all accepted the result of these researches as final; but now Prof. Lloyd Morgan has repeated the experiments, and shown that many of Mr. Spalding's conclusions are erroneous. It is only just to remark, however, that Dr. Reid had evidently no opportunity of consulting the then unpublished observations of Prof. Lloyd Morgan.

The second section is devoted to "The present evolution of Man." It is scarcely necessary to restate the common consensus of opinion that the evolution of Man, so far as general structure is concerned, has ceased, or, in other words, has arrived at an equilibrium with surrounding conditions. This is indeed so prevalent a conception, that by many of our best and most progressive thinkers the human evolution of the future is considered to lie purely in the domain of ethics. There is still, however, a physical arena where the struggle ensues, in which the survivors are not necessarily the strong in limb and mind alone, but "the strong against disease." To use the words of our author: "The present evolution of Man is therefore not mainly an evolution of physical or intellectual strength, as in his remote ancestry, but mainly an evolution against disease, and wherever men are crowded together, and can take disease from one another, or there are other unfavourable circumstances, especially against zymotic disease—that is, disease due to or produced by living micro-organisms."

Such diseases are not confined to Man alone, but are found to ravage other animals, and instances of such devastation will recur to the minds of most zoologists. In calling attention to this important factor, with the authority of personal experience and many gathered facts, Dr. Reid has undoubtedly introduced us to one of the neglected and by no means insignificant byways which intersect the broad road of evolution.

Journal of the Right Hon. Sir Joseph Banks, Bart., K.B., F.R.S.
Macmillan & Co. 1896.

To once more sail the seas with Capt. Cook, and again discover islands which are now visited weekly by ocean liners; to reperuse in current literature a description of the manners and customs of native races who are now either improved off the face of the earth, or vulgarized by the veneer of an unreal civilization, we thought impossible. Cook's 'Voyages' are now principally consulted by the ethnologist, or by those readers of light and leisure who still care to study the makings of the Greater Britain. We therefore owe a debt of gratitude to Sir Joseph Hooker for having taken us back to the geographical discoveries of some hundred years ago by publishing the journals of Sir Joseph Banks, written when as naturalist he accompanied Capt. Cook in the 'Endeavour' voyage of 1768-71.

Banks belonged to those select few who combine an ardent love of science with ample pecuniary means, and he proved a true patron of natural history. Thus we are told that when he decided to avail himself of the opportunity of exploring the then unknown Pacific Ocean,—“at his own expense, stated by Ellis to be £10,000, he furnished all the stores needed to make complete collections in every branch of natural science, and engaged Dr. Solander, four draughtsmen or artists, and a staff of servants (or nine in all) to accompany him.”

Most of the zoological observations recorded relate to animals which are very much better known now than then, but they are always interesting and sometimes almost fresh. Thus we learn that the Albatross devours *Physaliæ*, of which “an Albatross that I had shot discharged a large quantity, incredible as it may appear that an animal should feed upon this blubber, whose innumerable stings give a much more acute pain to a hand which touches them than nettles.”

Although in those days the zoologist experienced the greatest surprises when these expeditions returned with their natural history collections, he had still to be regaled with some “traveler's tales.” Thus, while at New Zealand and while drawing on shore, Mr. Sporing “saw a most strange bird fly over his head. He described it as being about as large as a Kite, and brown like

one; his tail, however, was of so enormous a length, that he at first took it for a flock of small birds flying after him; he, who is a grave-thinking man, and is not at all given to telling wonderful stories, says he judged it to be yards in length."

The ethnological information is most valuable, and supplements the observations of Cook and Forster. It seems inseparable to some expeditions that native life must be sacrificed, but it is not condoned in these pages; in fact, we are inclined to take leave of Banks by quoting some reflections that bespeak the nature of his mind and heart. Some New Zealand natives had been killed, and his journal for that day concludes:—"Thus ended the most disagreeable day my life has yet seen; black be the mark for it, and heaven send that such may never return to embitter future reflection." The portraits of Banks and Solander, in the possession of the Royal and Linnean Societies, are admirably produced by photography in this volume.

A Sketch of the Natural History of Australia. By FREDERICK G. AFLALO, F.R.G.S., F.Z.S., &c. Macmillan & Co. 1896.

If the ordinary traveller to a foreign land seeks a guide-book, or attempts by reading to obtain some idea of the salient features of the country he is about to visit, how much more necessary is it for the untrained zoologist to obtain at least a little information as to the animal life with which he hopes to become familiar. This, in a condensed form, is not at all common literature, and perhaps Tennent's 'Sketches of the Natural History of Ceylon' is a type of the book to which we refer, an introduction not a monograph; a general sketch of a fauna from which may be gathered its principal peculiarities, and a glimpse obtained of what may be expected to accrue in one's own special studies and pursuits. Such an inception has apparently guided Mr. Aflalo to his task, and he has succeeded in producing a primer to the Zoology of Australia.

And what a wonderful fauna it is! As Wallace has well remarked, "Australia stands alone." It is not more remarkable in the marsupials it so abundantly possesses, than equally distinguished by its complete poverty in many well-known forms.

"Who, for instance, is there but must feel surprise at the absence of Monkeys and Woodpeckers from its vast forests; or at the presence there, and there only, of the Platypus among the lower mammals, the Lories among birds, the double-breathing *Ceratodus* among fish."

The mammals, which number "not much over one hundred and fifty," are treated somewhat fully, with a list of species given at the end of each chapter. It is quite exasperating, in these days of vanished animal life, to find that the Platypus may be approaching extinction. Although "it is of the few indigenous animals not eaten by the natives," its skin has become a commodity with the furriers, though "thirty or forty of the animals must die to make even a small rug." "The Platypus is thus becoming lamentably scarce, and many a beautiful stream in Victoria and Tasmania, where whilom it rooted up the larvæ or engulfed the floating gnat, knows it no longer."

The birds have a very strong individuality; of some six or seven hundred species, some five hundred, "in round numbers, are found nowhere else." Like the Platypus, the Lyre-bird "is indeed doomed to extinction, and is already very scarce in the settled districts." Not much difficulty is experienced in tracing a cause. "Not long since, for example, two enterprising brothers employed a number of men to shoot the luckless male birds, in which, after some practice, they were unfortunately so successful, that five hundred dozen of the beautiful tails were reported to have reached Sydney in the course of a few weeks." This much persecuted bird lays but one egg each season.

Reptiles and Batrachians have received shorter treatment, but contribute many interesting records and facts, while the fishes of Australia receive more ample treatment. "The most striking characters of Australian sea-fish are their rainbow hues, projecting teeth, and a tendency to throw out spinous growths that make their safe handling a matter of some difficulty."

Our author was so fortunate as to witness a combat between the Thresher *Alopias* and a Whale. "The best combat of this nature that I ever witnessed was off Moreton Island. We steamed so near, indeed, as to distinguish, with the aid of the glass, the long upper lobe of the Threshers' tails, as two of those unflagging belligerents were falling on their ponderous enemy;

so near as to plainly hear (so marvellously are sounds carried over the water) the resounding blows and the feeble and ever feebler snorting of the succumbing Whale, which would have doubtless sounded out of harm's way but for the forbidding blade of some watchful Saw-fish which had made common cause with the assassins. How long the unequal combat had lasted before our arrival I am unable to say; but the end soon came, a commotion around the now motionless leviathan plainly indicating that the victors, assisted, perchance, by other Sharks, were already sampling the blubber."

There are many illustrations, and those of Australian fishes are particularly useful.

The Fishes of North and Middle America: a Descriptive Catalogue of the Species of Fish-like Vertebrates found in the Waters of North America, North of the Isthmus of Panama.
By D. S. JORDAN, Ph.D., and B. W. EVERMANN, Ph.D.
Washington: Government Printing Office. 1896.

THIS massive volume of 1240 pages is but Part I. of a colossal undertaking, and we are promised an atlas, containing anatomical figures and illustrations of many of the more important species on the completion of the second volume. In this instalment no less than 522 genera and 1627 species are described, and the publication forms No. 47 of the 'Bulletin of the United States National Museum.'

From the geographical limits of the fauna studied, it will be evident that the work will somewhat anticipate the description and enumeration of Pisces in the 'Biologia Centrali Americana' of Godman and Salvin, though of course it covers a far wider area, and apart from its special value to ichthyologists is a welcome addition to the zoological library, affording a handy and trustworthy book of reference as to the distribution of nearctic and of many neotropical fishes.

The text is naturally of a more or less technical description, though there are some passages which have the charm of narrative. Thus, in dealing with the family *Percidæ*, of which the great majority of the species treated belong to the subfamily

Etheostomatinæ (the Darters), "all the species of which group are American," and in considering the relation of the Darters to the Perches, the authors have quoted Prof. Stephen A. Forbes. According to this authority:—"Given a supply of certain kinds of food nearly inaccessible to the ordinary fish, it is to be expected that some fishes would become especially fitted for its utilization. Thus the *Etheostomatinæ* as a group are explained in a word by the hypothesis of the progressive adaptation of the young of certain *Percidæ* to a peculiar place of refuge and a peculiarly situated food supply. Perhaps we may without violence call these the mountaineers among fishes. Forced from the populous and fertile valleys of the river-beds and lake-bottoms, they have taken refuge from their enemies in the rocky highlands, where the free waters play in ceaseless torrents, and there they have wrested from stubborn nature a meagre living. Although diminished in size by their constant struggle with the elements, they have developed an activity and hardihood, a vigour of life, and a glow of high colour almost unknown among the easier livers of the lower lands. . . . Notwithstanding their trivial size, they do not seem to be dwarfed so much as concentrated fishes."

A pleasant feature in this volume is its dedication "To the memory of those ichthyologists of the past who have studied American fishes in America, in token of the only reward they asked—a grateful remembrance of their work." There follow forty-eight names in this roll-call, commencing with Georg Marcgraf, 1610-1644, and concluding with Marshall McDonald, 1836-1895.

The Migration of Birds: a Consideration of Herr Gätke's Views.

By F. B. WHITLOCK. London: R. H. Porter. 1897.

THIS brochure pertains to the atmosphere of ornithological polemics. It is "a consideration of Herr Gätke's views," but it is scarcely an approval of any of them. The work criticised is the well-known 'Die Vogelwarte Helgoland,' of which an English translation appeared in 1895, and was, as Mr. Whitlock correctly remarks, "hailed with universal welcome."

However, science is democratic, and though Herr Gätke—

whose death we now deplore—was, from his knowledge and opportunities, an authority of no mean order on his subject, there is no reason why Mr. Whitlock should not hold a brief in opposition. This he has done, and replied in a very trenchant manner to most of the views of Gütke; in fact, he almost traverses in detail the whole of that observer's work. The verdict must of course rest with those ornithologists who study the evidence on both sides, and though some of Mr. Whitlock's contentions seem to carry conviction, they are still so numerous that the old adage involuntarily arises, *quod nimis probat nihil probat*.

Report of Observations on Injurious Insects and Common Farm Pests during the year 1896. By ELEANOR A. ORMEROD, F.R.Met.Soc. Simpkin, Marshall & Co. Limited. 1897.

THE unostentatious and excellent work done by Miss Ormerod in the domain of economic entomology is to be found in that lady's Annual Reports of Observations, of which the twentieth, for the year 1896, is now before us. The *cui bono?* so frequently addressed to entomologists finds a sufficient answer in these Reports, and they bring us back to the well-known, but perhaps now too little read, pages of Kirby and Spence.

"The year 1896, like its predecessor, showed presence of many kinds of agricultural insect infestations, including in these crop, orchard, and forest pests; also infestations to live stock, and to Deer, though not in any instance to the extent of any one special attack being seriously prevalent over the whole of our island."

We find a good illustration and account of the "Red-bearded Bot Fly, *Cephenomyia rufibarbis*, which infests, in its larval condition, the nostrils and throat and mouth parts of the Red Deer. The authoress, quoting Dr. Brauer, states:— "*The method of attack* is for the flies to lay their small living maggots, in the early or middle part of the summer, at the opening of the nostrils of the Red Deer, up which they work, adhering by their mouth-hooks, until they reach the throat of the Deer, where they may still be found in February." . . . "The exit of the maggots takes place from early in March until April, through

the nose or mouth of their hosts." That this attack is prejudicial is evident by the fact that "if a Deer is attacked by many flies, soon, one after the other, its nose bleeds, and the mucous skin becomes very much inflamed. When the larval growth is nearly complete,—that is; at the third stage,—the maggots are to be found in the cavity of the mouth, or at the palate, the Eustachian tube, and other localities, as parts of the tongue and gullet." It is doubtful whether this attack is really new in our country, or whether its discovery is now due to the increased attention given to entomological research. Another "Deer Forest Fly," *Lipoptema cervi*, of which males and females are to be found in wingless condition on the Red and the Roe Deer, has been found by Mr. Dugald Campbell (Strathconan Forest, Muir of Ord) "to be very troublesome to those employed in flaying Deer in winter, by reason of their creeping rapidly about the clothes and into the hair of the workers, and being very difficult to dislodge." To the Deer themselves, however, this insect's presence is of no great consequence.

Perhaps to the readers of 'The Zoologist' these extracts may prove most interesting, and we do not refer to the larger portion of the Report devoted to the insect ravages on our vegetable crops. In conclusion, we can not only recommend its perusal to all who are interested in the details of our country life, but also advise them to communicate with Miss Ormerod as to any insect infestations with which they may become specially acquainted.

Das Tierreich.—1. Lieferung: *Aves*. (*Podargidæ*, *Caprimulgidæ* und *Macropterygidæ*). ERNST HARTERT. Berlin: Friedländer & Sohn. 1897.

THE first part of Section *Aves*, in the great descriptive Zoological Encyclopædia, has reached our hands, and is written by Mr. Ernst Hartert, of the Tring Museum. The importance of this work, and the way in which it will be probably consulted, quoted, and followed in the future, must not be underrated. Its proposed aim is nothing less than a synoptical description of the described forms of animal life. It is, perhaps, too much to

expect that the publication will be accepted as a finality in classification, but at least it will rank as a zoological *fin de siècle*.

The work is written wholly in German, and will thus prove a trial to many English zoologists, though the smattering of a language sufficient to read a zoological description is not very difficult to acquire. We English are bad linguists, and prefer translations where possible; but we are not alone, for even Strauss not only praised Schlegel's translations of Shakspeare and Calderon, but wrote: "We Germans can read in translations all that has been produced since nearly three thousand years, from the Ganges to the Tagus." It is possible, however, that some future linguistic latitude may be allowed, as among the list of promised contributors we notice the names of both English and French naturalists.

However, this feature will not remove the necessity of every working zoologist consulting at least the parts which relate to his own special studies.

EDITORIAL GLEANINGS.

THOSE of our readers who are interested in primitive and local names of birds and in Ornithological Folk-Lore generally, may well consult an article written by Dr. Edgar A. Mearns in the last (December) number of the 'American Anthropologist,' entitled "Ornithological Vocabulary of the Moki Indians."

"The Mokis inhabit a region of country in longitude 109°, lying just west of the New Mexico-Arizona boundary, north-eastward from the Little Colorado river, and 65 miles south of the Colorado."

The revision of the zoological vocabulary of the Moki language, of which this paper forms the ornithological portion, was made by the author with the aid of an exceedingly intelligent Indian named Ongwischey, so that mistakes should be few and misinterpretations seldom. It will be observed that some of the Moki names are of Spanish origin: "The fact is, the Moki tongue has become impure from contact with Mexicans and half-bloods from some of the new Mexican pueblos, where Indians and Mexicans live together."

The Mokis show an excellent acquaintance with raptorial birds, and Capt. Bourke is quoted for the fact that "Eagles are still raised in cages in Picuris, San Ildefonso, Santa Clara, Zuñi, Acoma, and the villages of the Moquis farthest to the west."

The specific names with Moki equivalents are given for 230 birds, though of course some margin must be allowed for error; for, as the author cautiously remarks:—"Although more attentive to nature than most whites, it must be remembered that the Mokis are not ornithologists, and cannot be expected to name even all birds that have fallen under their observation, much less such as have never attracted their critical attention, or to discriminate between closely related species, or those which resemble one another in colour or form."

THE Rev. H. A. Macpherson has contributed to the 'Annals of Scottish Natural History' an account of "The Distribution of the Red Grouse, *Lagopus scoticus*, and the Black Grouse, *Lyrurus tetrix*." The author writes:—"The Red and Black Grouse are both so plentiful upon the moors of the border counties of England and Scotland, that I have long expected to come across some additional instances of the well-known but

rare union between *Lagopus scoticus* and *Lyrurus tetrix*. It was therefore with great pleasure that I recently identified no fewer than four birds of this curious cross." These birds were secured at Shalloch, Kirkcudbrightshire—a moor of less than 3000 acres—and included a beautiful female hybrid. Two of these birds, male and female, were exhibited before the British Ornithologists' Club in November of last year, and their identification as hybrids between the Red and Black Grouse was accepted by all the members present.

At the March meeting of the Zoological Society of London Mr. Sclater called attention to the two specimens of Otters now living in the Society's Gardens, which had been received from Co. Down, Ireland, last year, and pointed out that they differed in several respects from the Common Otter. The Irish Otter had been separated specifically from *Lutra vulgaris* by Ogilby in 1834, under the name of *Lutra roensis*, and Mr. Sclater thought it was worthy of enquiry whether Ogilby was not right in his views.

At a February meeting of the Zoological Society of London Mr. G. A. Boulenger, F.R.S., read a paper entitled "A Catalogue of the Reptiles and Batrachians of Celebes, with special reference to the collections made by Drs. P. and F. Sarasin in 1893-1896." This memoir gave a *complete list* (with descriptions) of all the Reptiles and Batrachians, with the exception of the marine species, *known to occur in the Celebes*. The number of species of Reptiles enumerated was 83, and of Batrachians 21.

In the 'Irish Naturalist' for February, Mr. H. Lyster Jameson has written a paper on the "Bats of Ireland," giving as far as possible a complete range of the species.

"Seven species of Bats are known to inhabit Ireland, six of which belong to the family *Vespertilionidæ*, represented by three genera, *Plecotus*, *Vespertilio*, and *Vesperugo*, the seventh to the family *Rhinolophidæ*."

In the 'Proceedings of the Cotteswold Naturalists' Field Club,' vol. xii. part 1, is an interesting paper, by Mr. E. B. Wethered, on "The Depths of the Sea in Past Epochs." This is not so purely geological as its title might imply, and refers more to the organic life that then ensued and to the remains now found in the then sea bottoms. As the author remarks:—"Generally speaking, geologists have been content with fossils which could be detected without the aid of the microscope." The preliminary summary of results relates to the Silurian, Carboniferous, and Jurassic limestones:—

"The process which went on in the Silurian sea during the formation of the Wenlock limestone was this: the shells and skeletons of the larger marine organisms which existed, collected on the floor of the sea in very small fragments. Whether this condition was due to detrition, or to the fact that the creatures had served as food for large Ganoid fishes," the author has no knowledge. In Carboniferous days microscopic life must have been quite as abundant "as it was in the sea in which the chalk formation took place and in parts of the ocean of to-day." Of the Jurassic period Mr. Wethered refers the formation of the oolitic granules ("roestone") to organic origin.

The microscope has thus fresh fields to conquer; not only the unseen life of the present epoch, but the remains of the minute organisms of a long past.

THE following note on the breeding of the Caracal or Desert Lynx is taken from our contemporary 'The Field':—"About eighteen months ago (August, 1896), I purchased here a pair of 'Red Cat' kittens, which must then have been about four or five months old. By 'Red Cat,' as we call it out here, I mean the African Lynx, or Caracal. On December 10th last the cat had one kitten, which unfortunately died on the second day after its birth. No one out here seems to have heard of 'Red Cats' breeding in captivity, and so it may be of interest to record it. I am told that they have two kittens at a birth; on this occasion only one was born, which may be accounted for, perhaps, by its being the first litter. The mother is now expecting for the second time, and I hope in a few weeks to report the successful rearing of her second family. —J. W. JONES (Vryburg, Bechuana-land, February 1st)."

This note evidently refers to *Felis caracal*—"Rooi Kat" of the Dutch. Nicolls and Eglington, in their 'Sportsman in South Africa,' well observe that "when its size is taken into consideration, it is justly reputed to be, without exception, the most savage and intractable of the *Felidæ*. Even when obtained quite young and brought up by hand, it gradually develops a character, so to speak, of pure 'cussedness,' that any attempts to tame it have invariably proved unsuccessful."

IN the Report of the Superintendent of the National Zoological Park, Washington (Ann. Rept. Smith. Instit. to July, 1894), published in 1896, and just received, we read that a young Black Bear was "born on Feb. 5, 1894. There are but few opportunities for observing the growth of these animals, as they are rarely born in captivity. The little creature was very small at birth, not larger than a good-sized rat, weighing but nine ounces,

and it was thirty-nine days before it opened its eyes. It has been very vigorous and healthy from the first, and its development was evidently normal."

IN the Annual Report of the Royal Zoological Society of Ireland for 1896 we read that "the most interesting event which has occurred in the Gardens for many years took place early in the year. On the 6th of January, the female Cape Hunting Dog, *Lycaon pictus*, presented the Society with a litter of four cubs. It is very rare for these valuable and interesting animals to breed in captivity, although one or perhaps two litters are known to have been born in the Zoological Gardens in Amsterdam. In no case, however, has the mother reared her offspring. Two or three days after birth they have died through excessive anxiety for their welfare on the part of the mother during the nursing period. The slightest noise alarms her, and, seizing the pups in her mouth, she careers round the cage seeking a place where she can conceal her progeny. Unfortunately the litter born in the Dublin Gardens met the same fate. The puppies stood this treatment for three days and then they succumbed."

IN the 'Cape Times,' under date of Jan. 20th, a summary of Government Notice, No. 4, of 1897, is given, which relates to the general close or fence season for game in the various divisions of the Colony. The interest to zoologists is found in the list of animals which have been *specially protected*, for here we can read decrease and possible extinction on the wall.

In mammals, as restricted to various districts, and whose slaughter is prohibited for periods expiring in 1897, 1898, 1899, and even 1900, we find enumerated Aardvaark or Ant-eater, Rietbok, Eland, Klipspringer, Klipbok, Duiker, Grysbok, Bushbuck Ewes, Rhebok, Oribi, Steinbuck, Hartebeest, Wildebeest, Gemsbok, Koodoo, Blesbok, Bontebok, Giraffe.

In birds: Paauw, Plovers and Larks, Quail, Knorhaan, "Partridges," "Pheasants," and Guinea Fowls.

Insectivorous and other birds, in Albany and Uitenhage, to Dec. 23rd, 1899; all kinds of birds in Beaufort West Dam, to May 31st, 1898; and in Mossel Bay Municipal Commonage, to June 30th, 1897.

Great and Small Locust Bird, throughout the whole Colony to Jan. 22nd, 1899. This no doubt to increase the destruction of locusts.

ACCORDING to a Reuter's telegram from Blantyre, dated Jan. 12th, Mr. Poulett Weatherley, said to be the only British sportsman at the time in the interior, and who had circumnavigated Bangweolo and Chifunanti, bears witness to the ravages of the rinderpest among the wild game of South and East Africa:—"The rinderpest has killed off all Antelope

nearly the whole length of my journey. I saw very few Roan, a good many intensely shy Oribi, and a few ditto Senegal Hartebeest. One Buffalo was seen, but not by me. I saw two Zebra; beyond that, *nil*."

NATURALISTS will be pleased to learn that Mr. Edward Dodson is about to leave, or has left England for Morocco, with the object of investigating the fauna of the country around the Atlas range. This will be Mr. Dodson's third visit to Africa, his previous journeys being in connection with Professor Elliott's expedition to Somaliland and Mr. Donaldson Smith's scientific mission to British East Africa.

MR. J. E. S. MOORE has reached England on his return from Central Africa, which he visited to investigate the fresh-water fauna of Lake Tanganyika. In conversation with a representative of Reuter's Agency, Mr. Moore said:—"I found the fauna of Tanganyika to be unique—unlike anything else anywhere—and as limited as peculiar. The Jelly-fish and Shrimps were certainly of a marine type, while the geology of the district precluded the possibility of any connection with the sea in recent times. The water, which Livingstone found to be brackish, is now quite drinkable. All this seems to prove that the Tanganyika part of the great Rift Valley running through this part of Africa at one time had access to the sea, while it is perfectly clear that Lake Nyassa—some 246 miles to the south-east—apparently never had any marine connection. It is also a matter of interest that the fauna of Tanganyika is not only marine, but of a very peculiar and primitive type, and it is quite reasonable to suppose that the characteristics of the fauna are connected with the remote geological connection of the lake with the sea."

PROF. ANTON FRITSCH, of Prague, in the March number of 'Natural Science,' discusses the very important question of "Fresh-water Biological Stations." This investigation has already been commenced in America, Bohemia, Germany, and Russia, and it is quite time England joined that scientific concert. Last summer Prof. Fritsch lectured on more than thirty kinds of life-groups "of Bohemian fresh waters, each with its own special fauna and flora: springs, mountain brooks, mountain rivers, rivers of the plain, backwaters of large rivers, ponds, lakes, bogs, small pools with *Apus*, snow-tarns with *Branchipus*, &c. Each of these kinds of water varies in its own fauna with the season of the year, and also from year to year according as rain and sunshine also vary. Here is work for a century."

This work in Bohemia is done on admirable method, especially in these days of poor endowments. It is open to question whether poverty is not often the handmaid of research, though the crying shame is that it is so

often allowed to be considered as the proper atmosphere in which zoological scientific workers should be reared, and their investigations conducted. Prof. Fritsch's station consists of a movable building, which was presented to the Committee by a friend, and cost £70. "With its internal fittings, it now has a value of £200; yet everything is very humble, and the want of better instruments strongly felt. The annual working expenses of three investigators amount to £40, their work itself being given freely." Nevertheless they have just finished the examination of two lakes in the Böhmerwald, and the station has been transferred to Podiebrad, in the middle of Bohemia, for the investigation of the river Elbe,

It is to be hoped, as the Professor remarks, that it may soon be known that our "wealthy country has done her duty for fresh-water biology."

A SERIES of bibliographies of representative American naturalists was long ago commenced in the Bulletins of the United States National Museum. The series was naturally limited to the work of naturalists living and working in America, but one exception has been made in favour of Dr. P. L. Sclater, "the Secretary of the Zoological Society of London, who has confined his work for the most part to American ornithology, and whose contributions to the systematic ornithology of the American Continent have far exceeded in extent those of anyone working in this country." Thus writes Mr. G. Brown Goode in the introduction to "The Published Writings of Philip Lutley Sclater, 1844-1896," issued at Washington, 1896. This small volume contains a portrait, biographical sketch, and a chronological catalogue of all papers and notes published. There are 1287 bibliographical references.

WE have received the Sixty-third Annual Report of the York School Natural History, Literary, and Polytechnic Society for 1896. This institution seems to be in a fairly flourishing condition, and one of the most interesting items in the Report is the following:—"Last spring a number of boys kept fresh-water aquaria in the botanical room. In these the habits of newts, snails, fishes, and minute crustaceans were studied, some of the latter being drawn as viewed through the microscope." This is the training for the naturalists of the next generation—to observe the habits of live animals is as important as dissecting the bodies of dead ones; both studies are necessary, but there seems sometimes a danger of the first being somewhat neglected.

